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Book Reviews

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BOOK REVIEWS

NONLINEAR DYNAMICAL SYSTEMS AND CHAOS. The editors: H. W. Broer, S. A. van Gils, I. Hoveijn, F. Takens. Published in the series: Progress in Nonlinear Differential Equations and Their Applications, Volume 19. The editor: Haim Brezis, publishing house Birkhäuser, Basel-Boston-Berlin, 1996, 466 pages, DM 198,-.

This volume is the proceedings of the “Dynamical Systems Conference” held at the University of Groningen in December 1995. The main topics are: symmetries in dynamical systems, Kolmogorov-Arnold-Moser theories and other perturbation theory, infinite dimensional systems, time series analysis, numerical continuation and bifurcation analysis. There was more than twenty contributions and it is possible to mention here only some of them.

There was a group of theoretical contributions about the symplecticity and reversibility of elliptic operators (T. J. Bridges), S_n -symmetry-testing with the so called recursive detectives (K. Gatermann), symmetry breaking (R. Lauterbach). The qualitative theory was represented by a lecture about quasi-periodic motions in systems depending on parameters (H. W. Broer, G. B. Huitema, M. B. Sevryuk), normal forms of some vector fields (I. U. Bronstein, A. Ya. Kopanskii), symmetric ω -limit sets (J. S. W. Lamb, M. Nicol).

Some of the contributions were devoted to the bifurcation theory, e.g. the Hopf bifurcation at k -fold resonances in conservative systems (J. Knobloch, A. Vanderbauwhede), an outline of a global theory of singularly perturbed systems (J. Guckenheimer), bifurcations of autoparametric systems (M. Ruijgrok, F. Verhulst).

Other topics were: existence of modulated traveling waves in the perturbed Kortweg-de Vries equation (S. A. van Gils, E. Soewono), estimation of dimension and order of time series (F. Takens), computation of the invariant and unstable manifold (H. W. Broer, H. M. Osigna, G. Verter, M. Dellnitz, A. Hohmann).

Ivo Vrkoč

Geir E. Dullerud: CONTROL OF UNCERTAIN SAMPLED-DATA SYSTEMS. Birkhäuser, Boston, 1996, xiii + 177 pages, ISBN 3-7643-3851-2, price sFr. 68,-.

The main goal of the book is to provide a detailed treatment of uncertainty analysis for sampled-data systems in the context of system control theory. Here, sampled-data system refers to the hybrid system when continuous and discrete time are interconnected, while uncertainty analysis means achievable performance in the presence of worst-case uncertainty and disturbances. The book is divided into six chapters. Beside Introduction and Preliminaries (containing the mathematical background required), Chapters 3–6 are devoted to uncertain sampled-data systems, analysis of LTI (linear, time-invariant) uncertainty, computational framework, and robust performance, respectively.

Bohdan Maslowski

STOCHASTIC MODELLING IN PHYSICAL OCEANOGRAPHY. Robert J. Adler, Peter Müller and Boris L. Rozovskii, Editors, Birkhäuser, Boston, 1996, xi + 466 pages, ISBN 3-7643-3798-2, price sFr. 128,-.

The book presents a collection of eighteen papers on various aspects of theoretical and practical oceanography by either mathematicians or more applied physical oceanographers. They can be characterized, roughly, into three groups: Mathematical analysis of models that arise from, or are related to, physical oceanography; expositions by oceanographers of phenomena and models that they are working with today or would like to see developed in the future; and the interdisciplinary papers where the borders between the two disciplines become blurred.

The collection is quite far from being a standard mathematical book and gives an interesting feel for what is happening in the stochastic modelling of physical oceanography today and, perhaps, what is going to happen in the near future.

Bohdan Maslowski

Jerzy Zabczyk: MATHEMATICAL CONTROL THEORY: AN INTRODUCTION. Birkhäuser, Boston, 1995, (Second printing, with corrections), viii + 260 pages, ISBN 3-7643-3645-5.

The aim of the book is to give a self-contained outline of the mathematical control theory with emphasis on its typical and characteristic results such as controllability, observability and stabilizability, dynamic programming and the maximum principle.

The book is divided into four parts and an Introduction containing basic description of the most frequent control problems and several motivating examples. Part I is devoted to structural properties of finite-dimensional linear systems and contains elements of the classical theory of controllability, stabilizability and observability for this case. It also contains a chapter on realization theory which belongs to less traditional topics.

Analogous problems, but for nonlinear control systems, are treated in Part II. Part III concentrates on problems of optimal controls. The two most important methods are discussed: The Bellman optimality principle with its typical applications to linear regulator problem and to impulse control, and the Pontryagin maximum principle. Also, existence results based on the Filippov theorem are presented. Part IV of the book is devoted to infinite-dimensional linear control systems. Various concepts of controllability and stability are introduced and studied and the problem of the linear regulator in a Hilbert space is solved. At the beginning of the last part, a concise self-contained introduction to the semigroup theory is given.

Except perhaps for the last part of the book, in which certain familiarity with more advanced mathematical methods is supposed, only some basic knowledge of linear algebra and differential equations is required. The book can be recommended to anyone interested in fundamental results of classical control theory of finite-dimensional control systems or in their (less classical) infinite-dimensional counterparts.

Bohdan Maslowski